

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
6 May 2004 (06.05.2004)

PCT

(10) International Publication Number
WO 2004/038752 A3

(51) International Patent Classification⁷: **A01C 17/00**,
B01D 57/02, C02F 1/40, C12Q 1/00, H01J 7/24

(74) Agents: CALDWELL, John, E. et al.; Woodcock Was-
burn, L.L.P., One Liberty Place, 46th Floor, Philadelphia,
PA 19103 (US).

(21) International Application Number:
PCT/US2003/033200

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD,
SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG,
US, UZ, VC, VN, YU, ZA, ZM, ZW.

(22) International Filing Date: 20 October 2003 (20.10.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/420,003 21 October 2002 (21.10.2002) US

(84) Designated States (*regional*): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(71) Applicant (*for all designated States except US*): THE
GOVERNMENT OF THE UNITED STATES OF
AMERICA, as represented by the SECRETARY,
DEPARTMENT OF HEALTH AND HUMAN SER-
VICES [US/US]; Office of Technology Transfer, National
Institutes of Health, Suite 325, 6011 Executive Boulevard,
Rockville, MD 20852-3804 (US).

Published:

- with international search report
- before the expiration of the time limit for amending the
claims and to be republished in the event of receipt of
amendments

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): JANINI, George
[US/US]; 14220 Hiwood Road, Rockville, MD 20850
(US). ISAAQ, Haleem, J. [US/US]; 8103 Clearfield Road,
Frederick, MD 21702 (US). VEENSTRA, Timothy, D.
[CA/US]; 5540 Catholic Church Road, Jefferson, MD
21755 (US). CONRAD, Thomas, P. [US/US]; 312
Selwyn Drive, Apt. 3A, Frederick, MD 21701 (US).
WILKENS, Kenneth, L. [US/US]; 4712 Sterling Cross
Drive, Nashville, TN 37211 (US).

(88) Date of publication of the international search report:
29 July 2004

*For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.*

(54) Title: CONTIGUOUS CAPILLARY ELECTROSPRAY SOURCES AND ANALYTICAL DEVICE

(57) Abstract: Contiguous capillaries useful for separating and electrospraying a fluid comprising analyte and electrolyte are provided. The contiguous capillaries have spray tips at one end of the capillaries and electrically conductive portions in proximity to the spray tips. Methods for making the contiguous capillaries and their use as electrospray sources are also disclosed. Apparatus and methods for conveying analyte ions from the capillaries into analytical instruments, such as a mass spectrometer, are also disclosed. The disclosed contiguous capillaries may be used to carryout electrophoresis separation and electrospray ionization of analytes. Methods for obtaining the mass spectra of macromolecular analytes at concentrations lower than previously possibly are provided using the apparatus and procedures described herein.



WO 2004/038752 A3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/33200

A. CLASSIFICATION OF SUBJECT MATTER				
IPC(7) : A01C 17/00; B01D 57/02; C02F 1/40; C12Q 1/00; H01J 7/24				
US CL : 204/450, 454, 601, 604; 239/696; 314/550; 315/111.81; 435/4				
According to International Patent Classification (IPC) or to both national classification and IPC				
B. FIELDS SEARCHED				
Minimum documentation searched (classification system followed by classification symbols)				
U.S. : 204/450, 454, 601, 604; 239/696; 314/550; 315/111.81; 435/4				
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched				
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)				
West, Chem Abstracts				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
X	SHEN, Y. et al. High Efficiency Nanoscale Liquid Chromatography Coupled On-Line with Mass Spectrometry Using Nanoelectrospray Ionization for Proteomics. Analytical Chemistry. 15 August 2002, Vol. 74, No. 16, pages 4235-4249, see the abstract.	1-77		
Y	KERTESZ, V. et al. Minimizing Analyte Electrolysis in an Electrospray Emitter. J. Mass Spectrometry. February 2001, Vol. 36, No. 2, pages 204-210, see the abstract.	1-77		
Y, P	US 6,596,988 B2 (CORSO et al.) 22 July 2003, see the abstract, column 3 lines 38-42, column 6 lines 17-20.	1-77		
Y, P	US 2003/0089605 A1 (TIMPERMAN) 15 May 2003, see the abstract.	1-77		
A	US 5,245,186 A (CHAIT et al.) 14 September 1993.	1-77		
A	US 5,975,426 A (MYERS) 02 November 1999.	1-77		
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.				
<table border="0"> <tr> <td> <p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </td> <td> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p> </td> </tr> </table>			<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p>
<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p>			
Date of the actual completion of the international search		Date of mailing of the international search report		
12 May 2004 (12.05.2004)		27 MAY 2004		
Name and mailing address of the ISA/US		Authorized officer		
Mail Stop PCT, Attn: ISA/US		Ralph Gitomer		
Commissioner for Patents		Telephone No. (703) 308-1235		
P.O. Box 1450				
Alexandria, Virginia 22313-1450				
Facsimile No. (703) 305-3230				